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ABSTRACT

This publication is the design development presentation for an energy-conserving elementary school building proposed for Alief, Texas. Some of the energy conservation features presented in this proposal include: (1) wind powered emergency electrical system; (2) complete insulation resulting in a building with an over-all U factor of .04; (3) air heat pumps; (4) a control system that cycles the building down to zero energy input when not in use; (5) skylights to assist artificial lighting systems; (6) an automatic switching system to turn off lights near skylights when natural light is adequate; and (7) a panel to monitor electrical energy being consumed, located near the main entrance. Architectural drawings of interior and exterior scenes, floor plans, air conditioning distribution plans, and skylight plans along with a description of the wind generation system are included. Total cost estimated for the school plan presented here is $2,625,646. (MR)

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QQ0 264

Elementary School #9

ED164298

LIESTMAN ELEMENTARY SCHOOL

Alief Independent School District

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SE 025 450

DESIGN DEVELOPMENT PRESENTATION

June 28, 1977

FRANK F. LIESTMAN ELEMENTARY SCHOOL

ALIEF INDEPENDENT SCHOOL DISTRICT

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McDERMOTT-HUDSON ENGINEERING, CONSULTING ENGINEERS
SPAW-GLASS, INC., GENERAL CONTRACTOR
ALIEF INDEPENDENT SCHOOL DISTRICT

June 28, 1977

DESIGN DEVELOPMENT PRESENTATION

FRANK F. LIESTMAN ELEMENTARY SCHOOL
ALIEF INDEPENDENT SCHOOL DISTRICT

ALIEF INDEPENDENT SCHOOL DISTRICT ADMINISTRATIVE STAFF
McKITTRICK, DRENNAN, RICHARDSON & WALLACE, ARCHITECTS, A.I.A.
McDERMOTT-HUDSON ENGINEERING, INC., CONSULTING ENGINEERS
SPAW-GLASS, INC., GENERAL CONTRACTORS

I INTRODUCTION

The Alief Independent School District utilizes the "team approach" concept in planning, designing and constructing school facilities. The architect, engineer and contractor were employed by the district and the entire team worked together in development of schematic design for this school. The team members and their representatives are McKittrick, Drennan, Richardson and Wallace, Architects - Bruce Wallace; McDermott-Hudson Engineering - Jack Reber; Spaw-Glass, Incorporated - Jim Roach; and Alief Independent School District - R. C. Estes. The team had already started on design development studies prior to the approval of schematic design on March 8, 1977. During the design development phase the team encountered all of the normal D.D. challenges in addition to those created by the energy budget adopted prior to the formation of the team. Interactions of team members during the research of aesthetics, cost, energy, equipment, maintenance, etc. of various building systems strengthened the team enabling it to obtain and exceed all of the predetermined goals for this school. The results of the design development processes are summarized herein for the review and approval of the Board of Education.

A.	Kindergarten Area	
	1. 4 Teaching Stations @ 900 S. F.	3,600 S. F.
	2. Multipurpose Area (Art/Music/Films)	770 S. F.
	3. Restrooms/Storage/Kitchens/Coats	650 S. F.
B.	Academic Area	
	1. 30 Open Teaching Stations @ 900 S. F.	27,000 S. F.
	2. 6 Alternative Learning Centers @ 720 S. F.	4,320 S. F.
	3. 5 Multipurpose Rooms @ 720 S. F.	3,600 S. F.
	4. 5 Conference Rooms @ 120 S. F.	600 S. F.
	5. 5 Teacher Workrooms @ 108 S. F.	540 S. F.
	6. 5 Storage Closets @ 96 S. F.	480 S. F.
	7. Coat/Lunch Storage	1,600 S. F.
C.	Science Area	
	1. 2 Teaching Stations @ 900 S. F.	1,800 S. F.
	2. Storage	225 S. F.
D.	Music	
	1. Music Room	1,020 S. F.
	2. Storage (Props & Scenery)	100 S. F.
	3. Storage (Robes)	60 S. F.
E.	Developmental Learning Center	
	1. Engineered Classroom	1,564 S. F.
	2. 2 Small Group Instruction @ 240 S. F.	480 S. F.
	3. Speech Therapy	240 S. F.
	4. Perceptual/Motor Training	325 S. F.
F.	Instructional Materials Center	
	1. Stacks/Reference/Reading/Carrels/Kiva/Caves	6,480 S. F.
	2. Office/Workroom	420 S. F.
	3. A/V Storage	210 S. F.
G.	Physical Education	
	1. Gym	3,600 S. F.
	2. Office	140 S. F.
	3. Storage	246 S. F.
H.	Cafeteria	
	1. Dining Space	3,600 S. F.
	2. Serving Line	448 S. F.
	3. Snack Bar	144 S. F.
	4. Storage	224 S. F.
	5. Receiving/Storage	462 S. F.
	6. Stage	800 S. F.
I.	Administration	
	1. Counselor	180 S. F.
	2. Clinic (Nurse/Cots/Toilet)	400 S. F.
	3. Conference Room	120 S. F.
	4. Reception	240 S. F.

5.	Secretary	108 S. F.
6.	Principal (Includes Closet)	200 S. F.
7.	Asst. Principal (Includes Closet)	138 S. F.
8.	Workroom	230 S. F.
9.	Teachers' Lounge	476 S. F.
10.	Toilet	36 S. F.
11.	Vault	24 S. F.
12.	Circulation	212 S. F.
J.	Commons (Includes Entry Vestibules)	5,180 S. F.
K.	Auxilliary Facilities	
1.	Student Restrooms	1,740 S. F.
2.	Adult Restrooms	120 S. F.
3.	Bookrooms	420 S. F.
4.	Custodian (Storage/Lockers)	324 S. F.
5.	Mechanical Equipment Rooms	2,444 S. F.
	SUB TOTAL	78,340 S. F.
L.	Circulation	4,950 S. F.
M.	Exterior Walls	760 S. F.
	TOTAL BUILDING AREA	84,050 S. F.
N.	Covered Walks @ 1/2 and overhangs @ 1/2	2,155 S. F.
	GRAND TOTAL (A.I.A METHOD)	86,205 S. F.

III. OUTLINE SPECIFICATIONS

A. Sitework

1. Earthwork under building areas - strip 4" topsoil and place 32" select fill.

2. Earthwork under paving areas - cut and fill as required for drainage; use select fill or stabilize with 22 pounds hydrated lime/sq. yd.

3. Site drainage - surface run off to swales and drainage ditches.

4. Underground utilities.

5. Concrete curbs and gutters.

6. Concrete walks.

7. Drives - 6" concrete.

8. Parking area - 6" concrete.

9. Exterior lighting for parking and building.

10. Landscaping - solid sodding to control erosion where required, sprigging around sodding; trees. Sprinkler system to be included.

11. Fencing at service yard and kindergarten play area.

B. Structural System

1. Foundation - drilled and underreamed footings 8' deep.

2. Grade beams - reinforced concrete where required.

3. Slab - 4-1/2" thick steel rod reinforced concrete on 4" sand cushion.

4. Exterior walls - 6" tilt-up concrete panels; structural concrete with bush-hammered finish and facia panels of board form concrete; aluminum facia over entrances, bus canopy and overhangs.

5. Interior columns - precast concrete where exposed and structural steel where concealed.

C. Roof System

1. Typical structure - steel beams and long span joists at 6'-0" o.c. with 2-1/2" reinforced light weight concrete fill on corrugated metal deck.

2. Roofing - 20 year built-up, sloped 1/4" per foot to perimeter roof drains.

4. Finishes

a. Walls

1) Typical drywall - vinyl wall covering.

2) CMU with epoxy paint at Serving and Toilets.

3) 1-1/2" sound attenuating insulation with vertical hardwood battens at P.E./Cafeteria.

b. Ceilings

1) Typical - Suspended, exposed grid with 2'x 2' acoustical board with gypsum board furring at special areas and skylights.

2) Toilets - Gypsum board.

3) Exterior soffits - stucco.

c. Flooring

1) Typical - Minimum 28 oz. (yarn weight) Antron III carpet.

2) Multi-purpose - 3/32" vinyl asbestos tile.

3) Cafeteria & P.E. - Recreational resilient surfacing.

4) Serving & Commons - Sand cushion terrazzo.

5) Toilets - Epoxy terrazzo

6) Mechanical Rooms - concrete sealer.

7) Stage - Oak wood / pine behind front curtain.

d. Bases

1) Typical - 4" resilient base.

2) Mechanical Rooms - no base.

5. Specialties

a. Toilet partitions - plastic laminate doors and 4" C.M.U. partitions.

b. Toilet Accessories

1) Tissue holder - furnished by Owner.

2) Towel dispensers - furnished by Owner.

3) Soap dispensers - furnished by Owner.

4) Mirrors

3. Drainage - exposed downspouts connected to perimeter roof drains.

4. Flashing - neoprene.

5. Insulation - 4" styrofoam on top of built-up roof with aggregate above insulation (IRMA roof system).

D. Building Systems

1. Exterior enclosure

a. Insulation - 3-1/2" foamed in place urea formaldehyde.

b. Interior facing - 5/8" thick gypsum board.

c. Fixed glazing - anodized aluminum frames with 1/4" tempered sheet glass.

d. Sealant - Polysulfide Compound.

2. Interior partitions

a. At serving and toilets - 4" thick C.M.U.; running bond with epoxy paint.

b. Typical - 5/8" gypsum board on 3-5/8" thick metal studs.

c. Sound control - 45 decible STC rated partitions around offices and conference and 50 STC around Music, P.E./Cafeteria.

d. Relocatable partitions - Hufcor Twinline 6310, 10 feet high x 4 feet wide.

3. Frames

a. Exterior and interior - anodized aluminum.

b. Doors -

1) Exterior - 8'-0" high, narrow stile, anodized aluminum with 1/4" tempered glass.

2) Interior - 8'-0" high, 1-3/4" thick, plastic clad, solid core wood doors.

3) Exterior doors at service areas - hollow metal.

c. Hardware

1) Typical exterior - stainless steel panic hardware.

2) Typical interior where security is required - satin finish, stainless steel mortise locksets.

3) Typical interior- push, pull with roller latch.

5) Grab bars.

6) Mop racks.

7) Electric hand dryers

c. Graphics

1) Room identification plaques.

2) Exterior building identification.

3) Building plaques.

4) Miscellaneous painted graphics.

d. Chalkboards -porcelain on steel or 1/2 duracite.

e. Tackboards - vinyl plastic mounted on resilient cork underlay, 1/2" thick.

f. Flagpole - clear anodized aluminum.

6. Equipment

a. Casework - plastic laminate covered interiors, exteriors and countertops; recessed metal pulls.

b. Food Service Equipment - equipment similar to new serving line at E. A. Olle Middle School.

E. Air Conditioning and Ventilation

The advent of mechanical air conditioning in the 1960's caused a change in the philosophy of designing school buildings. That design concept is now being modified because of the increasing cost of energy. This design addresses itself to the shortage and increased cost of energy.

1. Design conditions are for 78° cooling and 72° heating.

2. The quantity of outside air is 2.5 cubic feet per minute per person.

3. Air conditioning is provided by water to air heat pumps.

4. Normally any heat that might be needed can be handled by turning on the lights. In special conditions such as after Christmas holiday where the temperature is lower because of shutdown time, the heating cycle of the heat pump assisted by solar heated water can be used.

5. The design of the skylights is such that little heat will penetrate into the building. The concern with having a well insulated school that retains heat in the winter and cool air in the summer has resulted in a school with an overall U factor of .04.

6. The air conditioning is a 124 ton system. Previous schools of this

size have contained 245 tons of air conditioning.

7. A very simple control system is set to cycle the building down to a minimum of zero energy when not in use.

F. Electrical System

1. Electrical service is 480/277 volt, 3-phase 4-wire and provided from a pad-mounted transformer in the service area.

2. Lighting fixtures and maintained light levels are as follows:

   a. Class areas - indirect fluorescent - 40 f.c.
   b. Halls, corridors - low brightness fluorescent - 15 f.c.
   c. Offices, conference rooms - low brightness fluorescent - 50 f.c. at desk
   d. Rest rooms - low brightness fluorescent - 25 f.c.
   e. Instructional Materials Center - Indirect high-pressure sodium - 40 f.c.
   f. P.E., cafeteria - Indirect high - pressure sodium - 25 f.c. daytime, 50 f.c. nighttime.
   g. Mechanical and Storage areas - Incandescent - 20 f.c.

3. Interior incandescent lighting and receptacles are fed from dry-type transformers. All other interior lighting utilizes 277-volt distribution.

4. Emergency and outdoor lighting is 120-volt D.C. fed froma bank of batteries. These batteries are recharged by two wind generators located on 40 ft. poles in the parking lot area.

5. The switching of lights in areas containing skylights is arranged to take advantage of natural light from the skylights. The switching permits lights closest to skylights to turn off whenever possible. A photo electric cell in each skylight activates a flashing light when the natural light reaches a level where the artificial light may be reduced or eliminated.

6. A panel is provided to monitor electrical energy being consumed and converts this to dollars and cents. That is located in the commons area by the front entrance.

7. A sound distribution and program system is provided. This will employ a six-program for class changes together with an "all-call" facility for emergency use.

8. An intercommunicating system will be provided to permit calls to be made between educational areas and support divisions to the office area.

9. Lighting only consumes 1.2 Watts per square foot.

10. Projected energy consumption is 16,500 B.T.U.'s per square foot computed on an annual basis.

G. Plumbing

1. The domestic water supply will generally consist of PVC piping.

2. The soil and waste piping system will consist of extra heavy cast iron underground. Small waste and vent piping will consist of cast iron, Type M or DWV, whichever is the most economical.

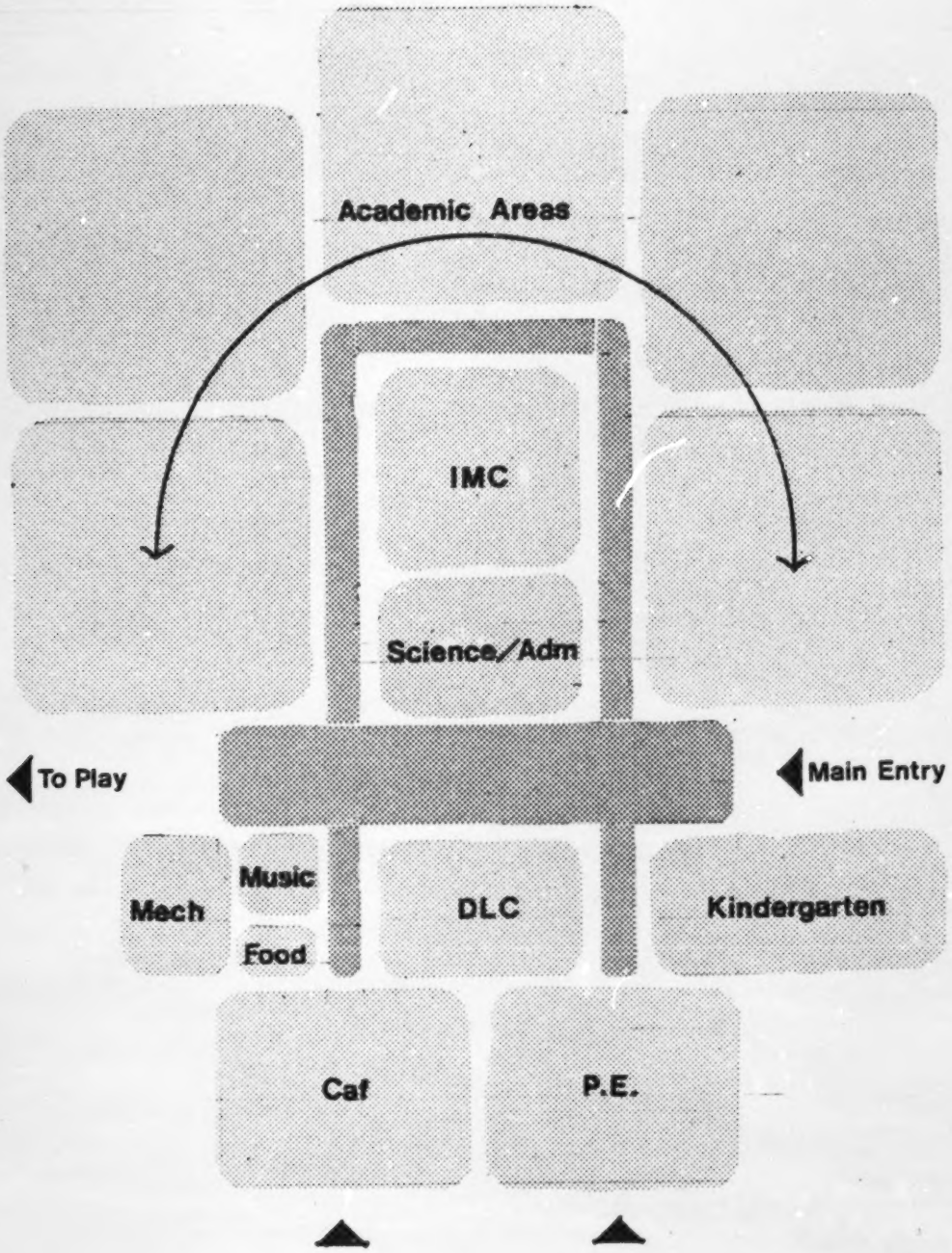
3. Plumbing fixtures will be provided to comply with State requirements. This will include proper mounting heights for wall mounted fixtures, including drinking fountains. The latest water saving devices will be employed in the fixture.

CONSTRUCTION COSTS ESTIMATE

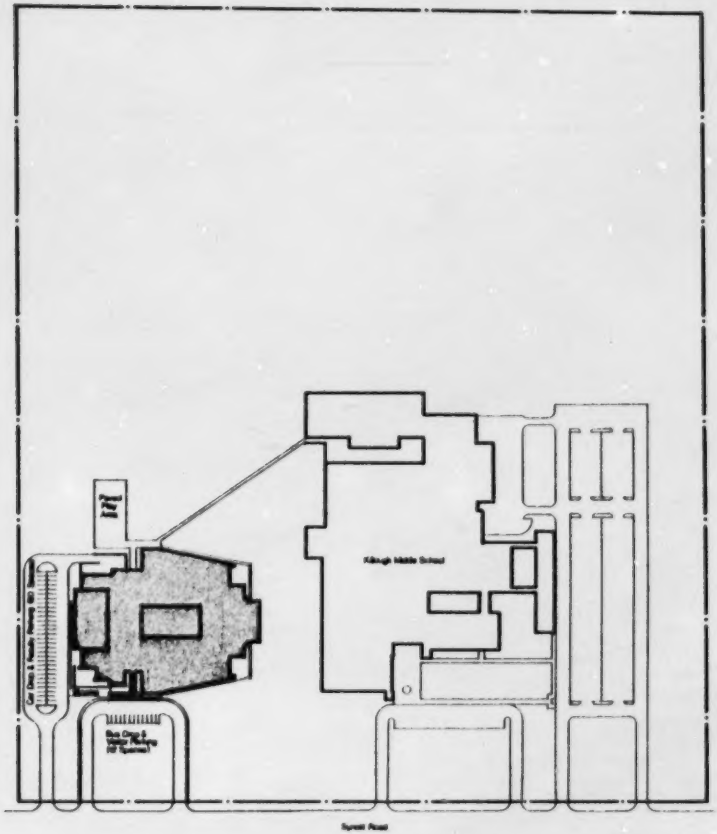
Description	Total
1. Sitework	$ 164,483.00
2. Earthwork	96,906.00
3. Landscape	25,000.00
4. Storm Drainage	24,455.00
5. Concrete	85,880.00
6. Formwork	11,294.00
7. Testing	4,000.00
8. Reinforcing	15,767.00
9. Structural Steel	102,320.00
10. Miscellanesous Metals	17,338.00
11. Precast Prestressed Panels	8,767.00
12. Masonry	67,408.00
13. Tilt-up Concrete	38,267.00
14. Waterproofing Caulking	8,746.00
15. Drywall	95,596.00
16. Carpentry	21,743.00
17. Millwork/Casework	109,050.00
18. Demountable Partitions	48,857.00
19. Finish Hardware	17,536.00
20. Glass & Glazing	71,925.00
21. Louvers and Access Panels	629.00
22. Doors	12,150.00
23. Folding Partitions	27,500.00
24. Perlite Roof Deck	61,764.00

Description	Total
25. Entrance Canopies	$ 19,178.00
26. Roofing	281,654.00
27. Insulation	18,100.00
28. Acoustical Ceiling	38,212.00
29. Plastering	13,868.00
30. Painting/VWC	83,128.00
31. Toilet Stalls	3,645.00
32. Ceramic Tile & Terrazzo	24,682.00
33. Resilient Floor/Carpet	99,132.00
34. Wood Stage	2,183.00
35. Lockers	450.00
36. Chalk and Tack Board	8,000.00
37. PE/Cafetorium Floor	19,632.00
38. Kitchen Appliances	550.00
39. Food Service Equipment	20,000.00
40. Electrical	249,700.00
41. HVAC	186,782.00
42. Plumbing	112,567.00
43. Fire Cabinet	1,950.00
44. Toilet Accessories	5,821.00
45. Venetian Blinds	2,600.00
46. Weatherstripping	875.00
47. Graphics	10,000.00
48. Stage Curtain	3,900.00
49. Prefabricated Shelving	6,650.00
SUBTOTAL	$ 2,400,622.00

Description	Total
50. Safety	$ 6,000.00
51. Material Handling	2,500.00
52. Final Clean-up	5,880.00
53. Overtime Premium (5% of Direct Labor)	12,301.00
54. General Conditions (1.5% of Direct Labor)	36,409.00
55. Labor Burden (22% of Direct Labor)	62,248.00
56. Builders Risk Insurance	3,330.00
57. Permits/Fees	1,260.00
58. Bonds on Subcontractors	7,990.00
59. Overhead and Profit	72,000.00
60. Bond on General Contract	15,106.00
TOTAL ESTIMATED COST TO ALIEF ISD	$ 2,625,646.00

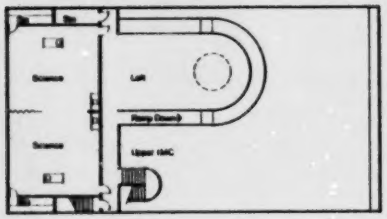

Academic Areas
IMC
Science/Adm
To Play
Main Entry
Mech
Music
Food
DLC
Kindergarten
Caf
P.E.

Plan Zoning

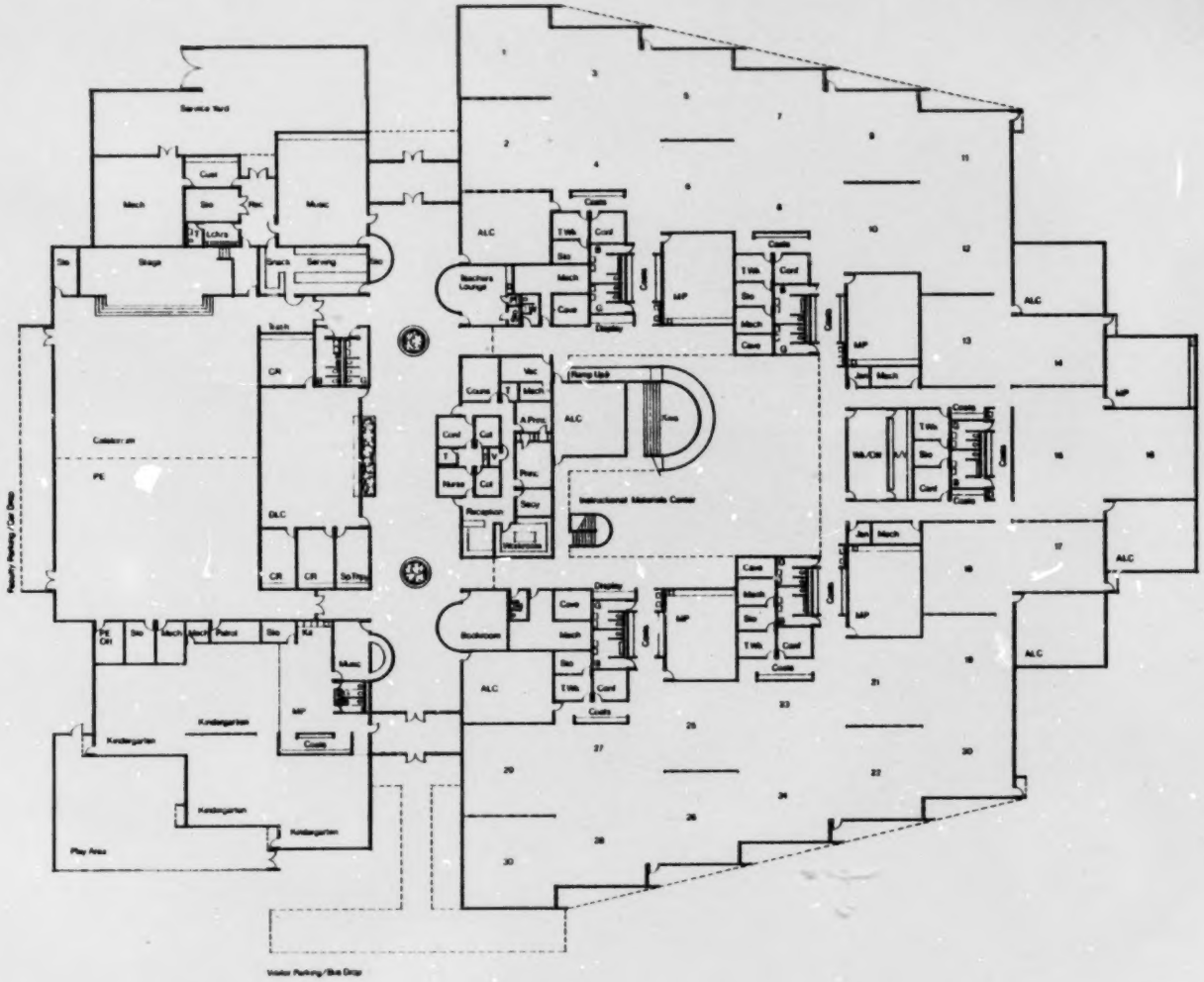


Design Development Site Plan

Linntown Elementary School - Adel Independent School District

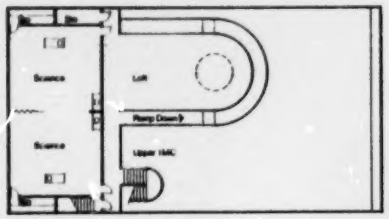


Second Floor Plan

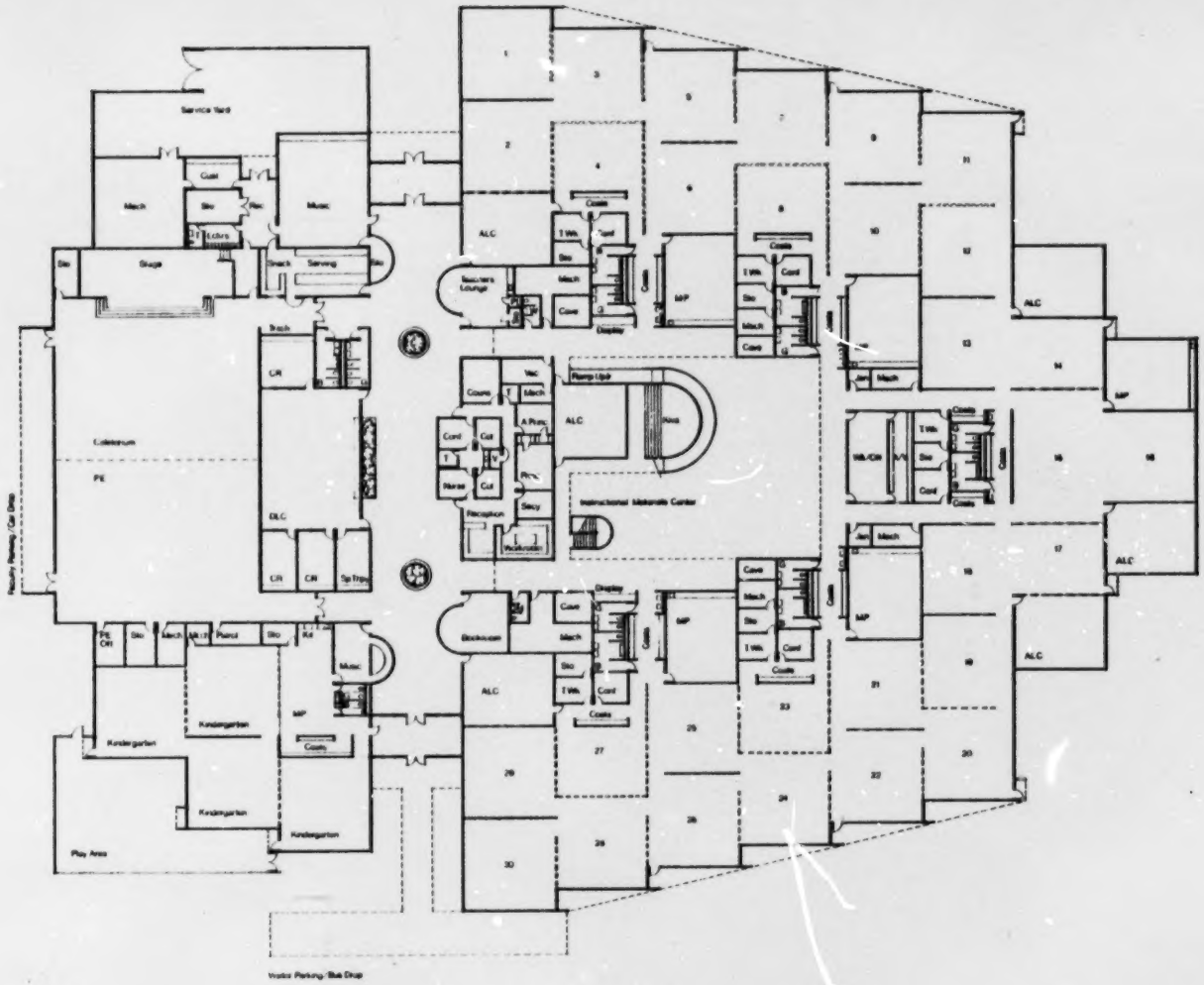


First Floor Plan

Demountable Partitions



Second Floor Plan



First Floor Plan

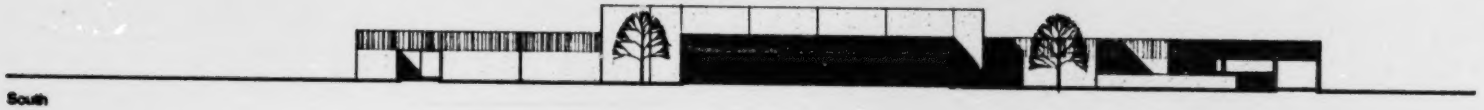
Demountable Partitions

Alternate Locations for Demountable Partitions

Design Development Floor Plans

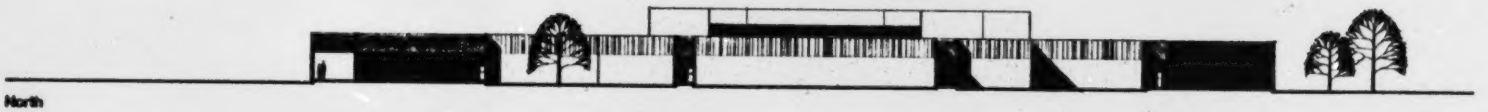
Livermore Elementary School Alief Independent School District

East



South

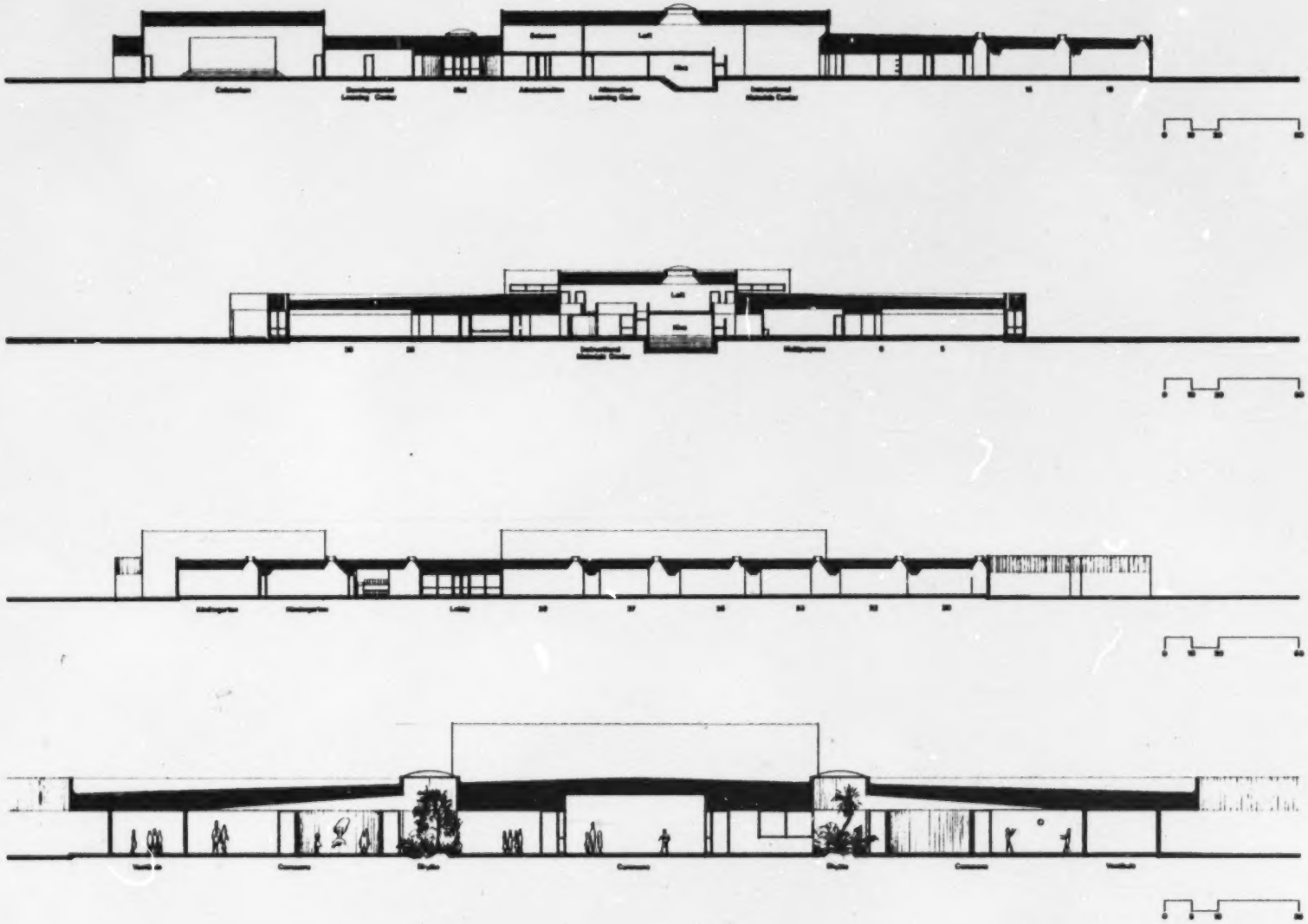
West



North

Design Development Elevations

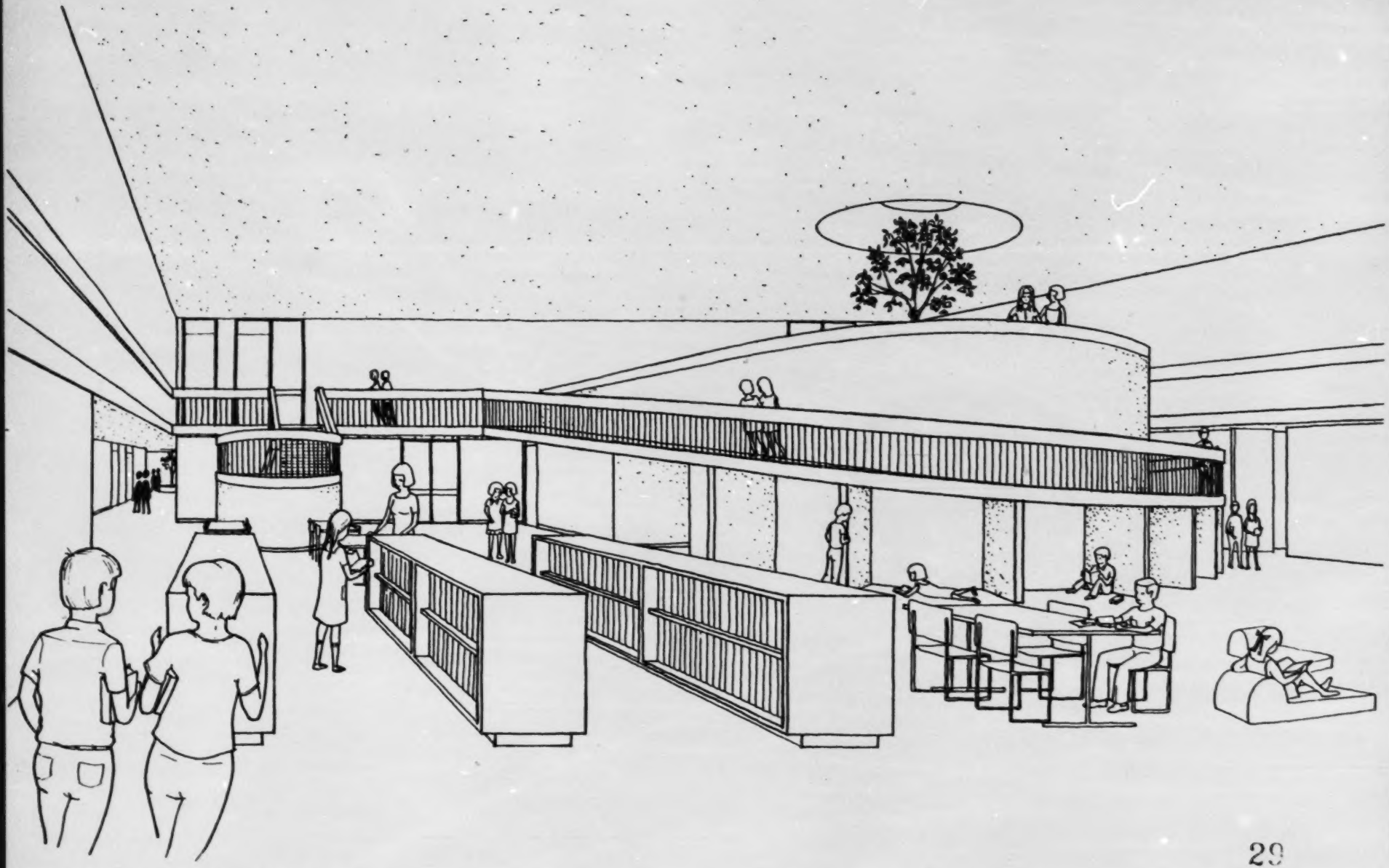
Lindsey Elementary School - Abel Independent School District



Design Development Sections

[illegible] Elementary School · Alief Independent School District

McKittrick Dresman Richardson Wallace Architects AIA



McKittrick Drennan Richardson Wallace Architects AIA

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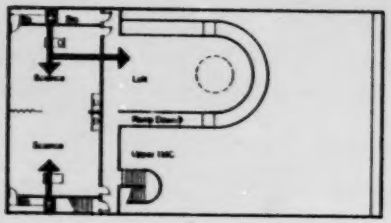
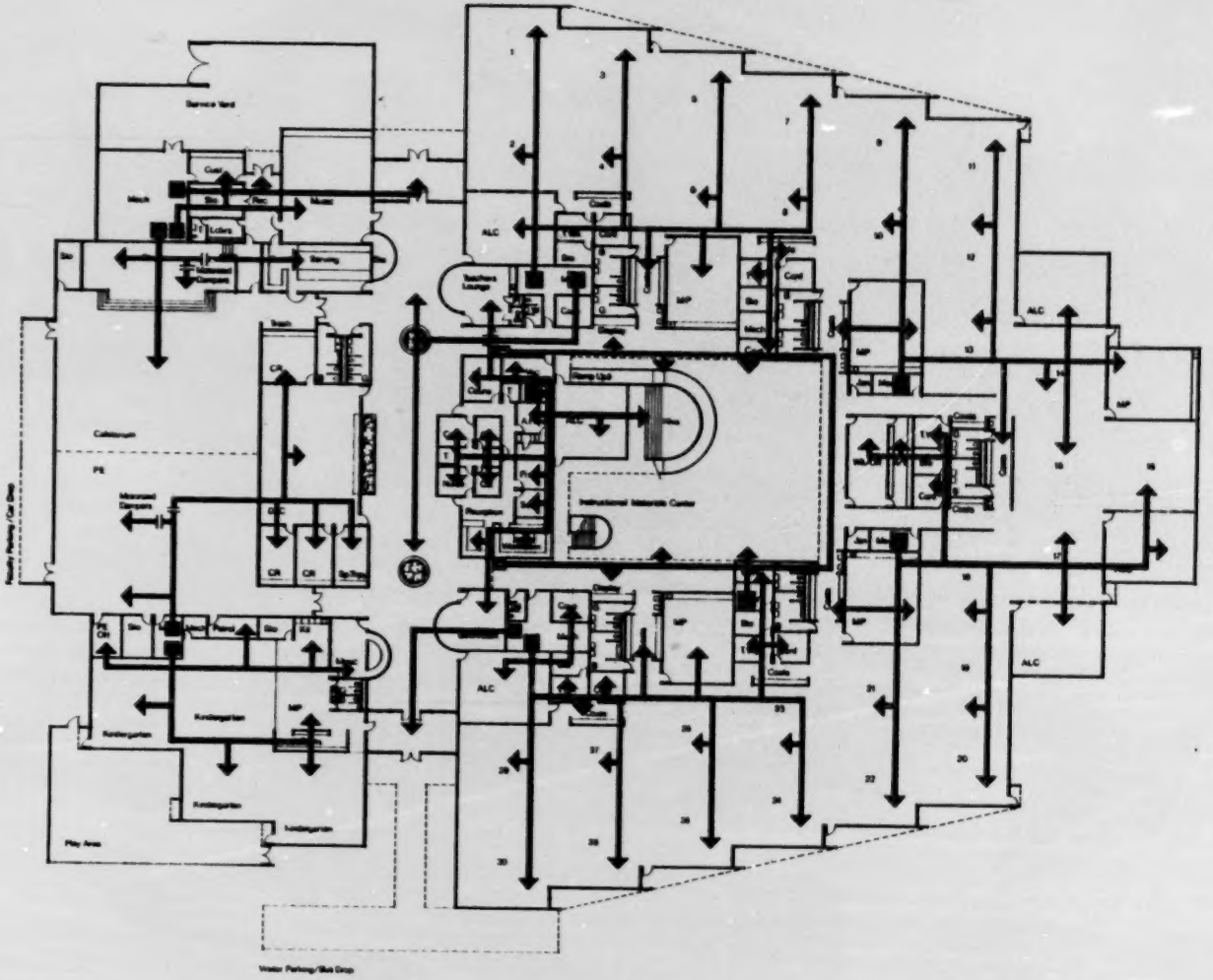


Second Floor Plan

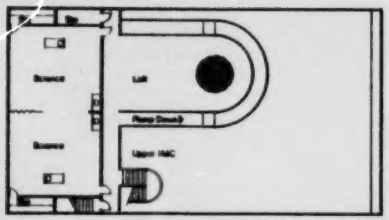


First Floor Plan

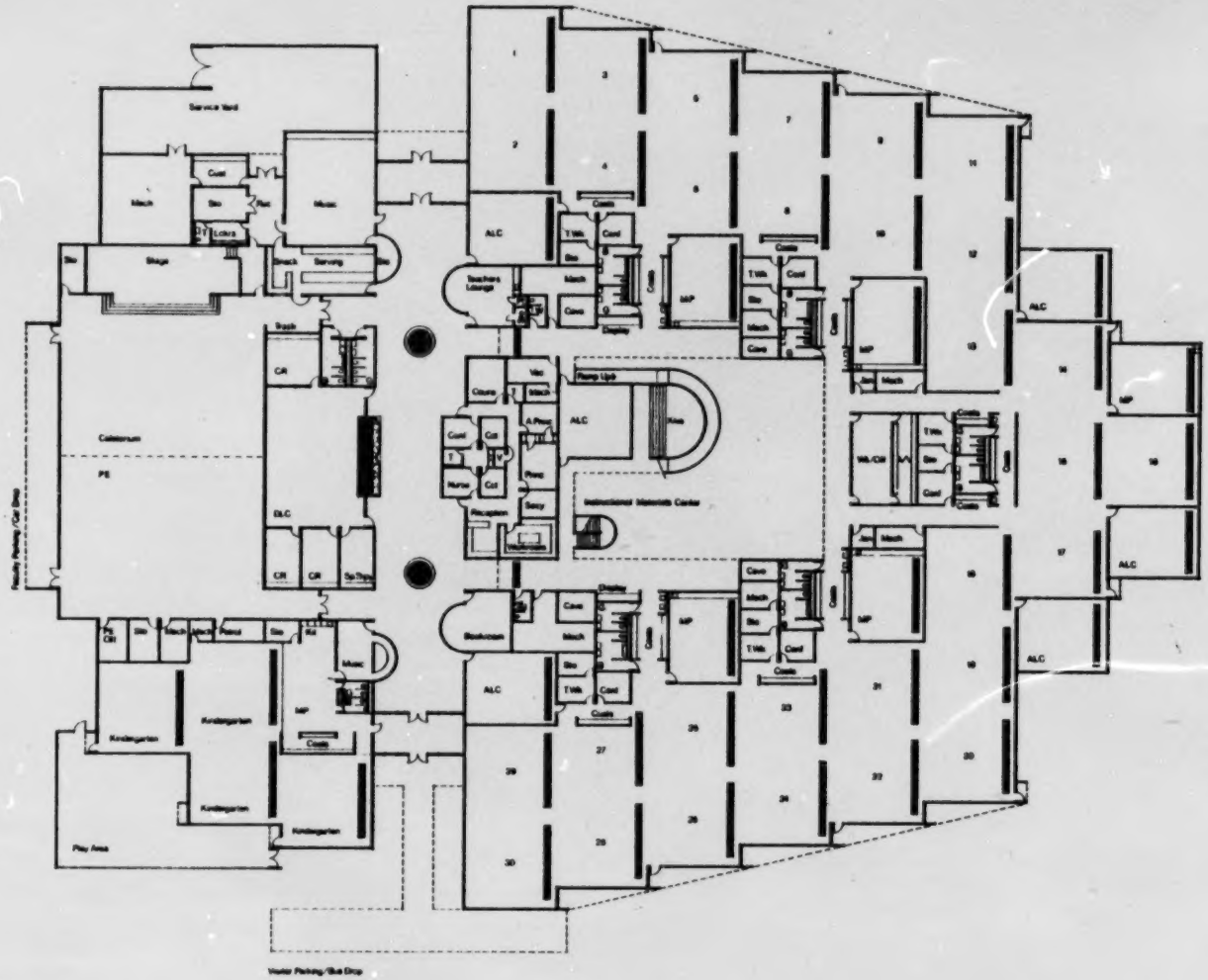
Design Development Floor Plans

Lindbergh Elementary School- Alief Independent School District

Air Conditioning Distribution Plan

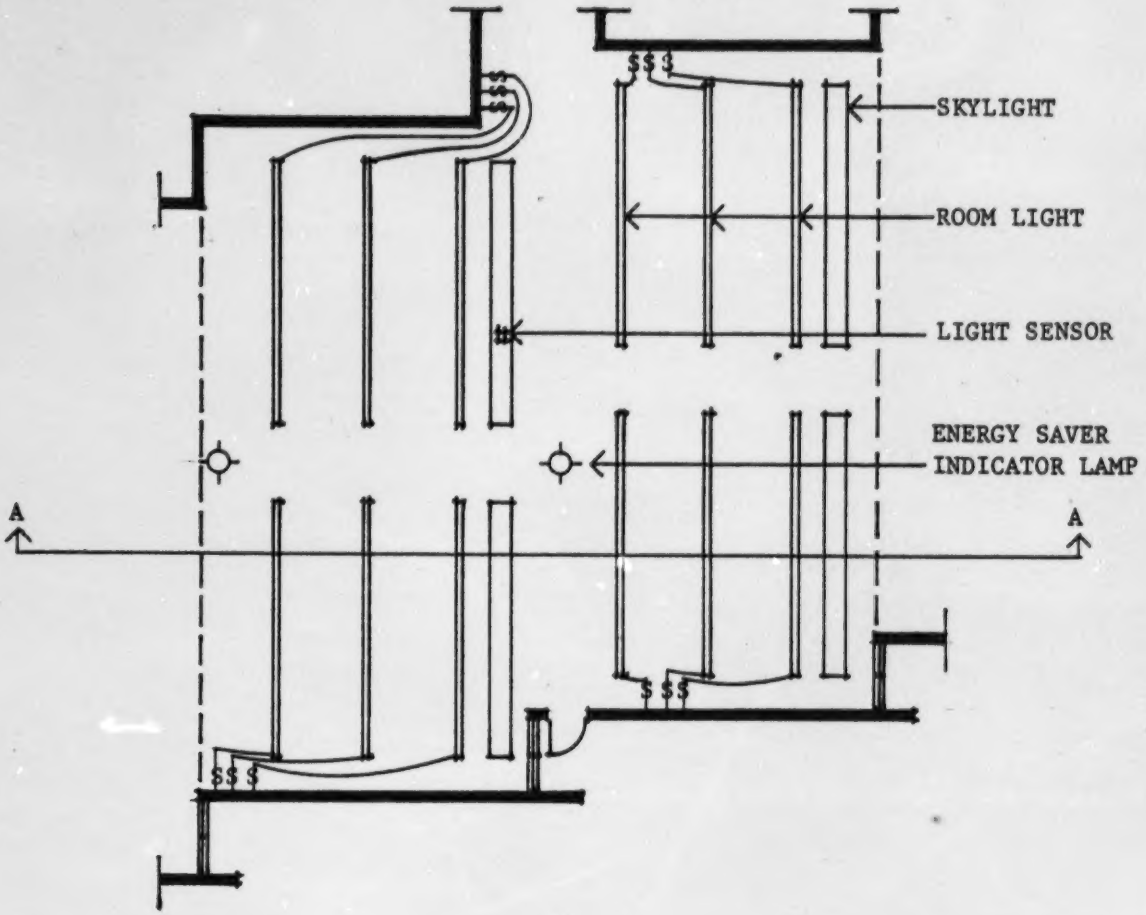


Second Floor Plan

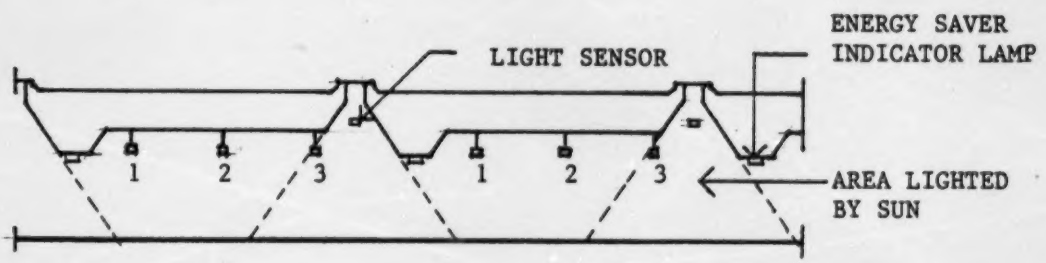


First Floor Plan

Skylites



TYPICAL CLASSROOM LIGHTING PLAN



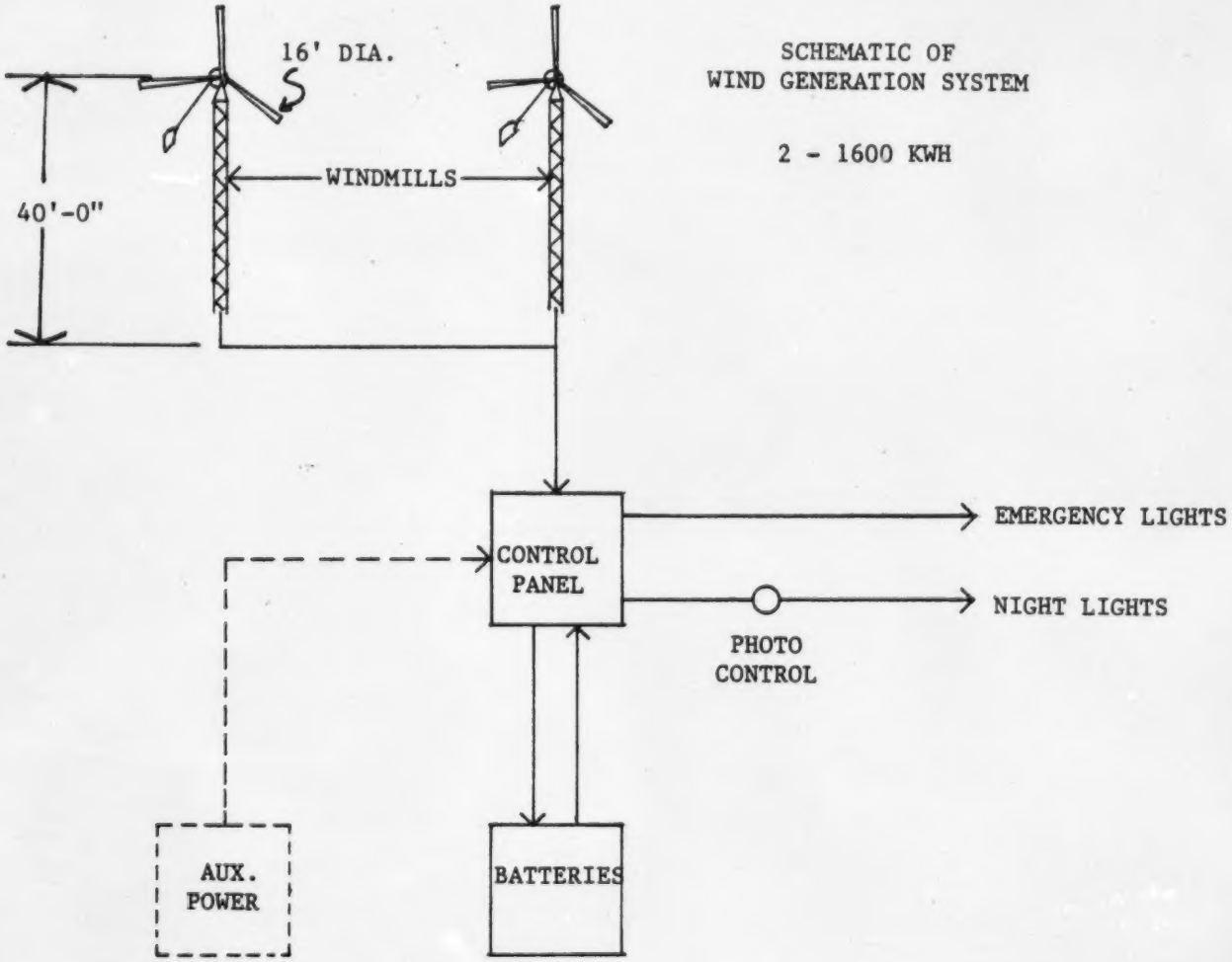
SECTION A-A

NOTE:
WHEN 45 FOOT CANDLES AT DESK HEIGHT OR MORE SUNLIGHT IS COMING THROUGH THE SKYLIGHT, THE INDICATOR LIGHT COMES ON. A STUDENT THEN TURNS OFF SOME OF THE CLASS-ROOM LIGHTS, THUS SAVING ENERGY. LIGHTS 1 & 3 CAN BE TURNED OFF, 2/3 OF CLASSROOM LIGHTING.

WIND GENERATION SYSTEM

All night lights consisting of 20 - 50 watt lamps or a total of 1000 watts powered by a 24 volt bank of batteries. This bank of batteries will consist of 12 exide iron clad batteries with a 790 amp-hour output rating. This 790 amp-hours will power the 1000 watts continuously for 19 hours without a recharge. The batteries will be recharged by two Kedco Model #1600 24 volt wind generators. In case of extended periods of low wind the system will automatically switch to be recharged by the buildings main electrical service. Controls are provided to prevent over-charging of the batteries. An audible and visual alarm energizes in case of low fluid or system failure. Water addition to the batteries under normal operation is only about once every 3 to 4 years. Life expectancy of the batteries is about 25 years.

The system also monitors the buildings incoming electrical service and when interruption in its service occurs, the D.C. system is switched on to power 20 exit signs and 100 emergency lights or a total of 4000 watts. The 790 amp-hours will power this 4000 watts continuously for 5 hours.



SCHEMATIC OF
WIND GENERATION SYSTEM

2 - 1600 KWH